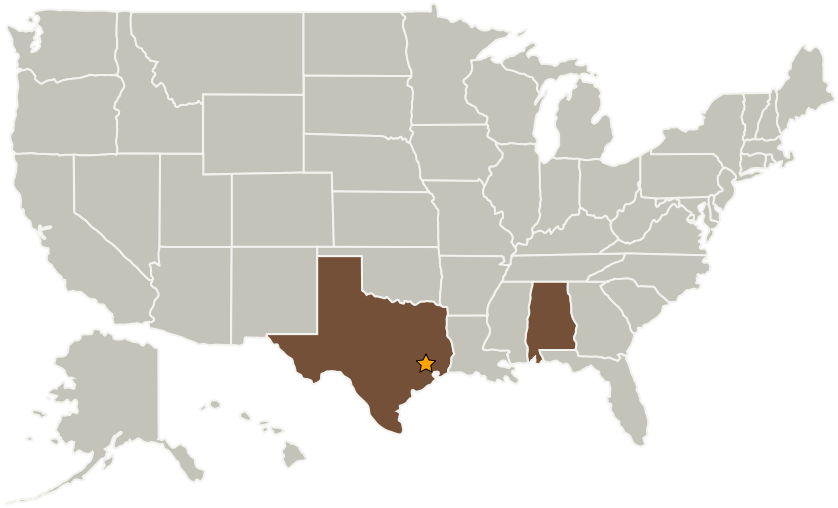
A Novel Microfluidic Device for Fully Automated Extraction of RNA from Cell Cultures, Phase I

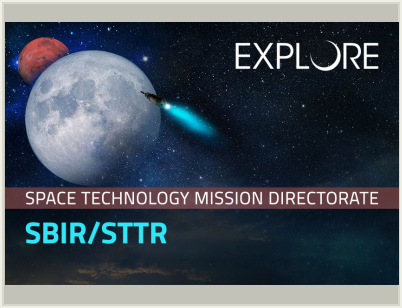
Completed Technology Project (2004 - 2004)

Project Introduction

Differential gene expression by RNA profiling is a universal and critical step in space biology experiments, which seek to link specific molecular events with disease phenotypes. Current RNA preparation methods are tedious, require substantial astronaut time, and necessitate exposure to toxic chemicals. They often have poor, unreliable yields due to RNase contamination. Our overall objective is to develop and commercialize a microfluidics based miniaturized platform (MED-RNA) that can fully automate the complex process of RNA extraction. Starting from harvested whole mammalian cells in a culture medium, MED-RNA will lyse, capture, extract/isolate and freeze/store RNA content for later analysis, in a fully integrated fashion with minimal user intervention. In addition to higher yields and faster process times, losses and contamination will be minimized as a result of the miniaturization and automation. A novel and unique plastic card based fabrication technology from Micronics Corp. will be leveraged for low-cost microfabrication. In Phase I, we will develop detailed design for the microfluidic lab card and the integrated system. We will also fabricate and demonstrate critical components (lysis and capture) of MED-RNA. The design process will be based on the state-of-the-art, multiphysics biochip design software from CFDRC. In Phase II, a fully integrated microfluidic lab card (including storage) will be developed and demonstrated on chosen cell lines.

Primary U.S. Work Locations and Key Partners





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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
CFD Research Corporation	Supporting Organization	Industry	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Shivshankar Sundaram

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  - TX11.5 Mission Architecture, Systems Analysis and Concept Development
    - TX11.5.2 Tools and Methodologies for Performing Systems Analysis